7.0 CUMULATIVE EFFECTS

7.1 INTRODUCTION

Cumulative effects, as defined in 50 CFR Section 402.02, "are those effects of future state or private activities, not involving Federal activities that are reasonably certain to occur within the action area." Future Federal actions require separate consultations pursuant to Section 7 of the Endangered Species Act (ESA) and are therefore not considered here. As indicated in Section 1.2.4 of this Opinion, the consultation regulations require that the effects of the action, including those of the environmental baseline, be considered together with any cumulative effects when determining jeopardy or adverse modification of critical habitat. See 50 CFR § 402.14(g).

There are two specific directives in this definition. One is that NOAA Fisheries focus its consideration of cumulative effects on those occurring in the action area, as defined in Section 5.1.1 of this Opinion. The second is that NOAA Fisheries only consider future State and private actions that are "reasonably certain to occur." Thus NOAA Fisheries must "consider the cumulative effects of those actions that are likely to occur, bearing in mind the economic, administrative, or legal hurdles which remain to be cleared." This was explained in the preamble to the final rule adopting the definition and use of cumulative effects in a jeopardy analysis (51 Fed.Reg. 19926 at 19933). The rule also stated that this standard "does not mean that there is a guarantee that an action will occur." Instead, the rule explained that "(f)or State and private actions to be considered in the cumulative effects analysis, there must exist more than a mere possibility that the action may proceed." Id.

The Consultation Handbook prepared jointly by NOAA Fisheries and the FWS provides an example of a cumulative effects analysis regarding "natural gas development" that was occurring within the action area. "Future natural gas development is a cumulative effect as it is regulated by the State. The frequent occurrence of new drilling sites in the area indicated that this activity was "reasonably certain to occur" in the future. Further, several landowners in the action area had recently signed contracts to sell their mineral rights to gas companies." Joint Handbook (at 4-31). Thus, the frequency of occurrence is an additional factor, but not a dispositive factor, in evaluating whether the cumulative effect is reasonably certain to occur.

The significance of the cumulative effects element of the jeopardy and adverse modification of critical habitat analysis is indicated by its function; the effects of the proposed action must be "taken together with cumulative effects" 50 CFR Section 402.14(g)(4). Thus, when evaluating the future effect of the proposed action, NOAA Fisheries must also consider the expected future effects of qualifying state and private activities together with the future effects of the environmental baseline, which also includes the likely future effects of Federal actions that have undergone ESA Section 7(a)(2) analysis (Section 1.2.2). What this also means, of course, is that NOAA Fisheries is not to consider the effects of any future state and private activities that are not "reasonably certain to occur" or are occurring outside the action area.

NOAA Fisheries has found from its evaluation of state and private activities in the environmental baseline that the habitat features important to salmon in the watersheds within the action area

were historically limited by such activities (see Section 5.0). Although these activities occurred in the past, their continuation in the future may depend upon the certainty of funding or the renewal of government authorization to satisfy the "reasonably certain to occur" test. In the absence of a record to support a finding that these actions are reasonably certain to occur, NOAA Fisheries must presume that these activities that have occurred in the past, and have limited the survival and productivity of the listed ESUs are not necessarily going to occur in the future. Based on the best available science, NOAA Fisheries would conclude that the condition of these watersheds will substantially improve in the coming years without the limiting effects of these activities.

The analysis in this chapter, therefore, is first to determine, on the available record, what future state and private activities are reasonably certain to occur in the action area and then to consider how those activities are likely to change the continuing effects of the environmental baseline. The overall objective of the analysis of the environmental baseline and cumulative effects is to get a picture of the conditions in the action area likely to occur without the proposed action and, therefore, to which the effects of the action would be added.

7.2 CUMULATIVE EFFECTS INVESTIGATION

In a memorandum dated November 26, 2003 (NMFS 2003c), NOAA Fisheries asked the state and Tribal fisheries Comanagers for help in discovering any non-Federal actions in the action area for this consultation that would affect listed fish or their habitat in either a positive or negative manner and were reasonably certain to occur. The Comanagers were asked to consider the following as indicators of actions that were reasonably certain to occur: approval of the action by state, Tribal, or local agencies or governments (e.g., permits, grants); indications by state, Tribal, or local agencies or governments that granting authority for the action is imminent; the project sponsors' assurance that the action would proceed; obligation of venture capital; or initiation of contracts. The Comanagers were also asked to consider the following questions:

- Has adequate funding been secured, or is there written documentation demonstrating that funding is imminent?[1]
- Have needed authorizations and/or permits been obtained, or is there written documentation demonstrating that such authorizations and permits are imminent?
- Is there other evidence, such as agreements, issued contracts, or other binding commitments, that demonstrates the action is "reasonably certain to occur," despite a lack of authorization or funding?

These situations were to be considered on a case by case basis.

The Nez Perce Tribe responded with a list of actions. The State of Idaho provided a summary, which included the conservation agreements for the Lemhi and Upper Salmon subbasins. These conservation agreements described partnerships to address land and water needs in the basins of the Salmon River drainage. Parties to the agreements intend to participate in a long-term

[1] NOAA Fisheries has included projects that were submitted for financial support from the Pacific Coast Salmon Restoration Fund as part of the environmental baseline.

Federal/state program for the conservation of fish and fish habitat, in which individuals may voluntarily participate and receive, in return, appropriate incidental take authorization and protection under the ESA for activities associated with water diversion. Although significant conservation benefits may flow from these voluntary agreements, the implementation of specific actions with immediate benefit to salmonids has not progressed to the point where they can be included within the cumulative effects analysis. The State of Washington referred NOAA Fisheries to its salmon recovery Web site (http://www.governor.wa.gov/gsro/sosreport/2002/partthree.pdf), which identifies projects, plans, and assessments proposed, developed, or implemented by the State of Washington through 2001. Although direct or indirect conservation benefit is likely to accrue from the listed projects that are reasonably certain to occur, there is, in the aggregate, insufficient information to conclude a measurable change in status of the ESU or in the condition of the environmental baseline in the action area. The State of Oregon stated that all its actions had been previously reported under the Pacific Coast Salmon Recovery Fund (PCSRF) reporting requirements. PCSRF-funded projects have a Federal nexus, which requires consultation under Section 7 of the ESA. Thus, the potential benefits of many future projects in the state of Oregon are considered in Section 5.0 in this Opinion.

In a separate effort, NOAA Fisheries collaborated with technical contacts from the states and Tribes to review information that local subbasin planners had developed for the Northwest Power Planning and Conservation Council's Subbasin Planning Process. These subbasin summaries and assessments describe both adverse and beneficial ongoing and future actions. Additionally, NOAA Fisheries reviewed available state, tribal and local subbasin and watershed plans, assessments and initiatives in order to anticipate the implementation of actions and their effects on the environmental baseline.

This investigation did not identify particular future, non-federal projects with specific documentation that they could be considered "reasonably certain to occur." However, NOAA Fisheries was able to discern some indications of cumulative effects based on an analysis of frequently occurring activities such as water withdrawals pursuant to senior state water rights. As explained above, the mere fact that an activity frequently occurred in the past is not dispositive of whether it is reasonably certain to occur in the future. That depends on the "economic, administrative or legal hurdles which remain to be cleared." (51 Fed.Reg. 19926 at 19933). However, frequent past occurrence is evidence that some level of activity is likely to continue into the future at least in the short term until current authorizations and funding expire. Although these historical and continuing non-federal activities are likely to contribute cumulative effects in the future, the ability of NOAA Fisheries to reasonably foresee them diminishes as they are projected into the future. They are most certain to occur in the immediate future, but the longer term becomes increasingly uncertain.

Similarly, for all ESUs, State, Tribal, and local governments there are programs that harm salmon habitat through legislation, administrative rules, policy initiatives, or permitting activities. Despite the fact that none of the States or Tribes provided evidence of specific harmful programs in their responses to the request for information from NOAA Fisheries, it is self evidence that many of the programs exist and contribute to the currently degraded status of the ESUs, as described in Sections 4.0 and 5.0. These harms are reasonably certain to occur and will

continue to degrade salmon habitat at least as long as the current authorizations for these activities last. Given the vast breadth of these harmful activities across all ESUs, it is impossible for NOAA Fisheries to provide anything more than a general analysis of their effects absent additional assistance from State, Tribal or local governments to identify these authorizations. NOAA Fisheries cannot presume that the current authorizations for these harmful effects will be renewed once they expire and, therefore, NOAA Fisheries must by law assume that the habitat will gradually approach a more pristine condition at some point in the future as these harmful activities cease. However, such eventual habitat improvements would likely not significantly effect these ESUs until after the term of this Opinion expires in 2014.

7.3 CUMULATIVE EFFECTS

As discussed in Section 5 for the Environmental Baseline, the action area for many of these affected ESUs includes all tributary subbasins to which adult fish return and therefore are potentially affected by a reduction of marine-derived nutrients. The subbasins evaluated for cumulative effects in detail in the following sections are those subbasins that will also be affected by conservation measures the Action Agencies are proposing as part of their Updated Proposed Action. Generally, NOAA Fisheries observed that the types of cumulative effects are likely to be similar across the subbasins of the action area with comparable types of habitats. These subbasins, discussed below, are generally representative of the remaining subbasins with similar habitat and land use. Appendix E, the Limiting Factors Analysis, prepared to guide the development of the UPA, further informs this evaluation of the potential for cumulative effects in the tributary habitat. The subbasins not discussed below are evaluated in Appendix E. For the purposes of this biological opinion the effects of these representative subbasins, described below, are extrapolated to all subbasins for the purposes of this cumulative effects analysis.

7.3.1 Mid-Columbia River Steelhead

7.3.1.1 John Day River

As discussed in Section 5.0, Environmental Baseline, the John Day Subbasin is an over-whelmingly rural area with relatively low populations. Many of these towns were historically sawmill towns. Large mills remain today in John Day and Prairie City. Over 95% of the lands within the subbasin are zoned for agriculture and forestry. Private and Federal lands are used mainly for livestock grazing and forage production. Urban lands make up only 0.3% of the land base. Ownership of the John Day Subbasin is 59% private, 31% USFS, 9% BLM/miscellaneous Federal, and 1% state. Private ownership is primarily in the lower subbasin. The USDA Forest Service manages much of the higher elevations in the subbasin. The Umatilla, Wallowa-Whitman, Malheur, and Ochoco national forests together make up 31% of the subbasin's total area. There is an increasing trend towards fragmentation of large private land holdings and associated rural development, ranging from hunting cabins to small subdivisions. Water withdrawals have reduced streamflows, especially during summer, and contribute to higher water temperature. Grazing, mining, timber harvest, and maintenance of pushup dams have reduced riparian vegetation and shade, also contributing to higher water temperatures and reducing habitat diversity. Pushup dams and reduced flows have created physical and thermal obstacles to fish movement. The John Day Subbasin, particularly along the Upper Mainstem and South Fork

John Day rivers, experienced numerous and intensive stream channelization, flow modification and drainage (including some tiling of drainage ditches) projects between 1943 and 1951.

Significant improvement in Mid-Columbia River (MCR) steelhead reproductive success outside of Federally administered land is unlikely without changes in grazing, agricultural, and other practices occurring within non-Federal riparian areas in the JDR basin.

7.3.1.1.1 Upper John Day. See 7.3.1.2

***7.3.1.1.2 Middle Fork John Day*.** See 7.3.1.2

***7.3.1.1.3 North Fork John Day*.** Road building and maintenance, timber harvest, mining, livestock grazing, and agriculture are all considered significant threats to MCR steelhead due to the lack of adequate regulatory control over these activities and uncertainty about their potential effects. In addition to the mining that occurs on Federal lands in the action area, there is also a significant amount of mining occurring on private lands throughout the watersheds of the NFJDR subbasin. The Granite Creek watershed includes the Alamo Mining District, which is characterized by many placer and lode mines. The extent of private mining actions is not specifically analyzed here, but field reviews by NOAA Fisheries biologists suggest that a significant amount of private land mining activity still takes place and is foreseeable for the future.

Another non-Federally regulated activity that takes place in the Granite Creek, Upper NFJDR, and NFJDR watersheds is small-scale recreational suction dredging. Although this activity is regulated by the State of Oregon, it can still have adverse effects on MCR steelhead or their habitat. The presence of a small number of recreational dredges would not likely disrupt stream processes, but the combined effects of a large number of recreational dredges operating in a stream within a single season could have significant adverse effects. NOAA Fisheries foresees continuing effects from these activities.

7.3.1.2 Umatilla

Economic diversification has contributed to population growth and movement, primarily in Morrow County. From April 1, 2000 to July 1, 2001, the population of Morrow County increased by 3.1%, while the state population increased only 1.5%. However, the population of Umatilla County increased by only 0.3%, and the population of Union County decreased by 0.8%. Increasing population trends will result in greater overall and localized demands for electricity, water, and buildable land in the action area. It will also affect water quality directly and indirectly and increase the need for transportation, communication, and other infrastructure.

The impacts associated with these economic and population demands will probably affect habitat features such as water quality and quantity, which are important to the survival and recovery of the listed species. The overall effect will likely be negative, unless carefully planned for and mitigated which, at this point, is uncertain.

Agriculture plays a major role in the basin. Irrigation water withdrawal from the Umatilla River and its tributaries at non-Federal facilities is a prominent activity in the basin and will likely continue to occur. Water withdrawal greatly reduces water quantity and quality in the lower Umatilla River, limiting adequate summer rearing conditions to spring-based refugia and resulting in habitat conditions insufficient to support migrating adult steelhead. In addition to affecting water quantity and quality, flow diversions also affect other key habitat components, including water temperature, passage, substrate, sediment transport, food production, and space. NOAA Fisheries assumes that future private and state actions will continue at similar intensities as in recent years and, as a result, will maintain degraded MCR steelhead habitat conditions on non-Federal land (NOAA Fisheries 2004h).

7.3.1.3 Yakima

The mainstem Yakima River and other Yakima basin tributaries are generally over-appropriated. This condition is unlikely to worsen as the State of Washington continues to clarify water rights through the adjudication process. Furthermore, the state is engaged, through the departments of Ecology and Fish and Wildlife and the Benton County Conservation District, in programs to improve instream flows in the lower Yakima River and its tributaries. If successful, such programs may improve water quality and quantity and riparian habitat in the lower Yakima basin.

The WDFW and Tribal Comanagers have been implementing the Wild Stock Recovery Initiative since 1992. The Comanagers are completing comprehensive species management plans that examine limiting factors and identify needed habitat activities. The State of Washington is under a court order to develop TMDL management plans for each of its 303(d) water-quality-listed streams. It has created and annually updates a schedule that outlines the priority and timing of TMDL plan development. Washington closed the mainstem Columbia River to new water rights appropriations in 1995 but lifted this moratorium in 2002. The state has proposed to mitigate the effects of new appropriation by purchasing or leasing replacement water when Columbia River flow targets are not met. The efficacy of this program is unknown at the present time.

It is expected that a range of non-Federal activities would occur within the Yakima River Basin for the purposes of restoring and enhancing fish habitat. These activities would likely include installing fish screens, improving flow management and irrigation efficiency, restoring instream and riparian habitat, and removing barriers to passage. Although the specific details of individual projects are lacking, it is assumed that non-Federal conservation efforts would continue or increase in the near future.

7.3.1.4 Deschutes

The only known state or private activities that are foreseeable within the Deschutes basin are future grazing and agricultural activities on private land within the action area. Significant improvement in MCR steelhead reproductive success outside of Federally administered land is unlikely without changes in grazing, agricultural, and other practices occurring within non-Federal riparian areas in the Deschutes Basin. Until improvements in non Federal land management practices are actually implemented, NOAA Fisheries assumes that future private

and state actions will continue at similar intensities as in recent years and as a result will maintain degraded MCR steelhead habitat conditions on non-Federal land.

7.3.2 Upper Columbia Steelhead and Spring/Summer Chinook

The State of Washington has various strategies and programs designed to improve the habitat of listed species and assist in recovery planning. Washington's 1998 Salmon Recovery Planning Act provided the framework for developing watershed restoration projects and established a funding mechanism for local habitat restoration projects. The Watershed Planning Act, also passed in 1998, encourages voluntary planning by local governments, citizens, and Tribes for water supply and use, water quality, and habitat at the Water Resource Inventory Area or multi-Water Resource Inventory Area level. WDFW and Tribal Comanagers have been implementing the Wild Stock Recovery Initiative since 1992. The Comanagers are completing comprehensive species management plans that examine limiting factors and identify needed habitat activities. The state is also establishing the Lower Columbia Fish Recovery Board to begin drafting recovery plans for the lower Columbia region.

Water quality improvements will be proposed through development of TMDLs. The State of Washington is under a court order to develop TMDL management plans on each of its 303(d) water-quality-listed streams. It has created and annually updates a schedule that outlines the priority and timing of TMDL plan development. These efforts should help improve habitat for listed species, although future implementation of TMDLs is not sufficiently certain to qualify as cumulative effects. Washington closed the mainstem Columbia River to new water rights appropriations in 1995 but lifted this moratorium in 2002. The state has proposed to mitigate the effects of new appropriation by purchasing or leasing replacement water when Columbia River flow targets are not met. The efficacy of this program is unknown at the present time.

7.3.2.1 Methow

Generally, local conservation efforts and habitat restoration projects will continue to improve conservation and restoration of spring chinook salmon and steelhead habitat on non-Federal land in the region of the proposed action. Furthermore, improvements such as infrastructure upgrades planned for other water diversions in the Chewuch and Methow basins will probably reduce the contribution of those diversions to future habitat degradation.

Other non-Federal diversions in the Chewuch River contribute to adverse effects on instream flows for fish. For example, the two other sizable diversions are Chewuch Canal (31 cfs) and Fulton Canal (20 cfs) located downstream of the Skyline Ditch at RM 8.0 and RM 0.7, respectively. Because these diversions do not constitute a Federal action, no ESA consultation will be done and withdrawals in accordance with established water rights are expected to continue at similar levels into the immediate future with associated effects. However, the above-mentioned entities, together with the Skyline Ditch Company, have formed the Chewuch Basin Council to cooperatively seek efficiency improvements to their water delivery systems and to seek flow plan and habitat improvements to maintain adequate instream flows although the likely effects of their efforts are too uncertain for this analysis.

Existing studies report that conversion of water use from irrigation to domestic use is related to real estate development in the Methow Basin (Peterson and Jackson 1990; EMCON 1993; Methow Valley Planning Committee 1994). Continuing real estate development (especially for residential use) is expected to continue into the foreseeable future. The precise effects of expected development on in-stream flows during low flow periods, late summer/early fall and winter, have not been documented. However, estimates from these reports show that if only six percent of the saved water from total irrigable acres in the basin (12,900 acres) is converted to domestic use, an additional 950 homes could be built in the basin, which could support approximately 2,800 people. The basin's current population is only about 4,500. Using water saved from irrigation to support development in the face of an expanding population in the basin will maintain habitat that is not properly functioning to adequately meet the biological requirements of the listed ESUs.

7.3.2.2 Entiat

Current land uses within the Entiat include agriculture (primarily pear and apple orchards), livestock production and grazing, timber harvest, residential housing, and recreation. The U.S. Forest Service (USFS) manages approximately 83% of lands within the subbasin. Wilderness, old growth reserves, wildlife and riparian reserves make up 63% of the USFS land designation, which includes some areas in the lower valley that currently do not fall within the other land use categories. Irrigated agriculture land area is 0.4% of the watershed and, with developed recreation areas (including trails) and residential areas, makes up approximately 1% of the total land area, most of which is along the riparian corridor. The Entiat River Subbasin Salmon and Steelhead Production Plan identified water withdrawals, both agricultural and domestic, as an issue of concern relative to their potential to exacerbate normal low flows of late summer in the Entiat River (NWPPC 2004d). NOAA Fisheries finds that continued water diversion at existing rates is reasonably foreseeable for the immediate future.

7.3.2.3 Wenatchee

In many watersheds, land management and development activities have: reduced connectivity (i.e., the flow of energy, organisms, and materials) between streams, riparian areas, floodplains, and uplands; elevated fine sediment yields, degrading spawning and rearing habitat: reduced large woody material that traps sediment, stabilizes streambanks, and helps form pools; reduced vegetative canopy that minimizes solar heating of streams; caused streams to become straighter, wider, and shallower, thereby reducing rearing habitat and increasing water temperature fluctuations; altered peak flow volume and timing, leading to channel changes and potentially altering fish migration behavior; and altered floodplain function, water tables, and base flows (Henjum *et al.* 1994; McIntosh *et al.* 1994; Rhodes *et al.* 1994; Wissmar *et al.* 1994; NRC 1996; Spence *et al.* 1996; and Lee *et al.* 1997). Agricultural activities are presently the main land use in the action area. Summer low flows are modified by irrigation diversions, and riparian buffers contain little woody vegetation. Consistent instream flows are essential for fish survival. Riparian habitat is essential to salmonids in providing and maintaining various stream characteristics such as channel stabilization and morphology, leaf litter, and shade. Given the patterns of riparian development in the action area and rapid human population growth of Chelan

County (27.5% from 1990- 2000, per the U.S. Census Bureau), it is foreseeable that some riparian habitat will be impacted in the future by non-Federal activities.

The State of Washington has various strategies and programs designed to improve the habitat of listed species and assist in recovery planning. Washington's 1998 Salmon Recovery Planning Act provided the framework for developing watershed restoration projects and established a funding mechanism for local habitat restoration projects. The Watershed Planning Act, also passed in 1998, encourages voluntary planning by local governments, citizens, and Tribes for water supply and use, water quality, and habitat at the Water Resource Inventory Area or multi-Water Resource Inventory Area level. Washington's Department of Fish and Wildlife and tribal Comanagers have been implementing the Wild Stock Recovery Initiative since 1992. The Comanagers are completing comprehensive species management plans that examine limiting factors and identify needed habitat activities. The state is also establishing the Lower Columbia Fish Recovery Board to begin drafting recovery plans for the lower Columbia region. Water quality improvements will be proposed through development of Total Maximum Daily Loads (TMDLs). The State of Washington is under a court order to develop TMDL management plans on each of its 303(d) water-quality-listed streams. It has developed a schedule, which is updated yearly, that outlines the priority and timing of TMDL plan development. These efforts should help improve habitat for listed species although there is not currently enough certainty to include them in this analysis as cumulative effects. Washington closed the mainstem Columbia River to new water rights appropriations in 1995 but lifted this moratorium in 2002. The state has proposed to mitigate the effects of new appropriations by purchasing or leasing replacement water when Columbia River flow targets are not met. The efficacy of this program is also unknown at this time (NOAA Fisheries 2003d).

7.3.2.4 Okanogan

Between 1990 and 2000, the population of Okanogan County, Washington increased by 18.6% (US Census Bureau 2003). Thus, NOAA Fisheries assumes that future private and state actions will continue within the action area, increasing as population density rises. As the human population in the action area continues to grow, demand for agricultural, commercial, or residential development is also likely to grow. The effects of new development caused by that demand are likely to further reduce the conservation value of habitat within the action area.

7.3.3 Snake River Spring/Summer Chinook, Steelhead and Sockeye

7.3.3.1 Upper Salmon, Little Salmon, Lemhi

Non-Federal actions are likely to continue affecting ESA-listed fish species. The cumulative effects in the action area are difficult to analyze, given the broad geographic landscape covered by the action area, the uncertainties associated with non-Federal actions, and ongoing changes to the region's economy. Whether those effects will increase or decrease in the future is not known; however, based on the subpopulation and growth trends identified in this section, the adverse effects of non-Federal actions are likely to increase. NOAA Fisheries expects the environmental baseline to remain static or decrease slightly due to ongoing non-Federal actions. Predominant ongoing activities on state, Tribal, and private lands include timber harvest, range management

and grazing of domestic livestock, and road construction. Land uses also include limited amounts of cultivation and irrigation of hay fields and pastures, water diversions, and residential development. State laws regulate these activities.

State-administered logging and grazing is expected to contribute short-term adverse effects to spawning, rearing, and migration conditions for anadromous species.

Grazing on state land is currently operated under Best Management Practices (BMPs) established under Grazing Management Plans overseen by the IDL. Grazing BMPs, as identified in the Idaho State Agricultural Pollution Abatement Plan (State Plan), are not mandatory but are recommended for private lands. Because compliance with the State Plan is not required on private lands, no monitoring plan is in place to evaluate potential direct and indirect impacts on ESA-listed fish species or designated critical habitat.

The populations of urban areas within the action area have been growing rapidly and are predicted to continue to grow. Rural areas, on the other hand have been fairly static, and populations are predicted to remain static or increase at a slower rate. As populations increase in urban and rural areas, Federal land ownership is likely to change little; therefore, it will be up to private and state lands to absorb the increase in population. However, effects from non-Federal lands are expected to be highest for chinook salmon and steelhead in the Little Salmon subbasin, which has a relatively high percentage of non-Federal land (31%). Effects on steelhead, sockeye, and chinook salmon in the Upper Salmon subbasin are also expected to be high. Although a much lower percentage of private and state lands are found in that subbasin, a wide variety of land uses occur and are expected to continue to occur.

Home and business construction is likely to continue along the Lemhi River along with agricultural use of the surrounding lands. Numerous water diversions from the Lemhi River and its tributaries alter the river's natural hydrograph and will likely continue to do so into the future. Potential adverse effects caused by these ongoing private activities could impact the suitability of habitat for chinook salmon and steelhead. The effects of these activities may include sediment delivery into the river from private roads, chemicals leaching into the river from yards or livestock pastures, livestock grazing that damages the riverbank or removes riparian vegetation, or low flow periods that reduce fish passage. There are some private landowners seeking opportunities to alter agricultural practices or improve equipment to reduce negative impacts on ESA-listed salmonids; these efforts will likely result in beneficial effects to chinook and steelhead habitat. However, NOAA Fisheries is not currently able to consider these as cumulative effects, because they are not yet reasonably certain to occur.

The IDEQ has established TMDLs in the Snake River basin, a program likely to have positive water quality effects. The TMDLs are required by court order. The Lemhi Subbasin has a TMDL that addresses water quality on the Lemhi River and seven tributary streams. The primary Lemhi River TMDL water quality concern is fecal coliform bacteria (IDEQ 1999). The State of Idaho has created an Office of Species Conservation to work on subbasin planning and to coordinate the efforts of all state offices addressing natural resource issues. Demands for Idaho's groundwater resources have caused groundwater levels to drop and reduced flow in springs for which there are senior water rights. The Idaho Department of Water Resources has begun studies

and promulgated rules that address water right conflicts and demands on a limited resource. The studies have identified aquifer recharge as a mitigation measure with the potential to affect the quantity of water in certain streams, particularly those essential to listed species.

Snake River spring/summer chinook are known to spawn and rear in the Snake River mainstem. This area is discussed below in 7.3.4.2, Snake River Mainstem.

7.3.4 Snake River Fall Chinook

7.3.4.1 Clearwater

Land use in the Clearwater includes agricultural, timber harvest, roads, development, recreation, mining, and livestock grazing. Current levels of these uses are likely to continue, but detailed information on non-Federal activities in the action area is not available. Livestock grazing may partially thwart weed control efforts. Cattle can spread weeds through their droppings and create conditions that increase the likelihood that invasive weeds will out-compete native plants. Riparian cattle grazing on non-Federal lands is likely to affect water temperature and water quality in portions of the action area.

Impaired water quality from ongoing agricultural activities is likely to be one of the largest effects present in the action area. Cultivated croplands are likely to produce large amounts of sediment and increase water yield, and relatively large amounts of pesticides are also likely to be applied to croplands in the action area. City, state, and county governments also have ongoing weed spraying programs with less stringent measures to prevent water contamination. Weeds are sprayed along road right-of-ways annually by city, state, and county transportation departments, sometimes several times a year. NOAA Fisheries staff have observed county road crews spraying herbicides on streambank vegetation and directly into the water in Clearwater and Idaho counties, and it is probable that similar practices will continue.

7.3.5 Lower Columbia River Coho and Upper Willamette River Steelhead

7.3.5.1 Tualatin

A wide variety of activities occur in the portion of the action area that is within the Tualatin River basin. These activities have the potential to impact fish and habitat within the action area. Continued urban development and ongoing agricultural practices including water diversions will affect the water quality and hydrology. A continuing trend of high summer temperatures, higher discharges of flows immediately following storm events, and lack of habitat structure in the Tualatin River to dissipate energy are expected. Future Federal actions, including the ongoing operation of the Tualatin River flood control system, hatcheries, fisheries, and land management activities, will be reviewed through separate Section 7 consultation processes.

Between 1990 and 2000, the population of Washington County, Oregon increased by 42.9% (U.S. Census Bureau 2003). Thus, NOAA Fisheries assumes that future private and state actions will continue within the action area, increasing as population density rises. As the human population in the action area continues to grow, demand for agricultural, commercial, or

residential development is also likely to grow. The effects that new development that are caused by that demand are likely to further reduce the conservation value of habitat within the action area.

NOAA Fisheries is not aware of any specific future non-Federal activities within the action area that would cause greater impacts to listed species than those that are ongoing now. NOAA Fisheries assumes that future private and state actions will continue at similar intensities as in recent years.

7.3.5.2 Cumulative Effects Common to Multiple ESUs

7.3.5.3 Estuary and Columbia River Mainstem

Columbia River Estuary and mainstem are part of the Federal Navigation System. Most future actions in this area will have a Federal nexus and require consultation. Therefore, future actions are not evaluated under cumulative effects. At this time, NOAA Fisheries is not aware of any reasonably foreseeable future non-Federal activities within these areas that would cause greater effects to listed species than presently occurs.

7.3.6 State Managed Recreational Fisheries

The states of Idaho, Oregon, and Washington conduct recreational fisheries in tributaries to the Snake River that target marked hatchery fish. Incidental mortality from the catch and release of unmarked listed steelhead is estimated at 3.2% in Idaho. Recreational fisheries for spring/summer chinook salmon in Idaho are managed based on the number of natural-origin spring chinook salmon that escape above Lower Granite Dam (Table 7.1).

Table 7.1. Expected harvest rates for listed Snake River spring/summer chinook salmon in Idaho recreational fisheries.

Lower Granite Dam Predicted Return of Naturally Produced Listed Spring Chinook	Maximum Percent of Naturally Produced Spring Chinook Mortality for Idaho Recreational Fishery	Range of Potential Incidental Mortalities (Number of Fish)	Estimated Total Take (catch and release)
< 2,800	0%	0	-
2,800 to 4,500	0.25%	7 to 11	70 to 110
4,501 to 10,000	0.5%	22 to 50	220 to 500
10,001 to 15,000	0.75%	75 to 112	750 to 1,120
15,001 to 20,000	1.0%	150 to 200	1,500 to 2,000
20,001 to 25,000	1.5%	300 to 375	3,000 to 3,750
> 25,000	2.0%	>500	>5,000

Ongoing recreational fisheries are conducted in the upper Columbia River that affect listed salmon and are summarized in Tables 7.2 and 7.3.

Table 7.2. Authorized annual take level of ESA-listed species as a result of recreational fisheries implemented by the Washington Department of Fish and Wildlife in the Columbia River Basin upstream of Priest Rapids Dam, 2000-2004.

Fishery	UCR spring chinook				UCR steelhead [1]			
	Juvenile		Adult		Juvenile [2]		Adult	
	Take	Mortality	Take	Mortality	Take	Mortality	Take	Mortality
Methow River trout fishery	870	44	1	0	3000(h) 9500(n)	150(h) 475(n)	10	1
Mainstem Columbia River summer/fall chinook fishery	0	0	0	0	0	0	25	3
Icicle Creek spring chinook fishery	0	0	8	8	0	0	20	2
Whitefish fishery	0	0	0	0	0	0	15	1
Smallmouth bass, walleye, and sturgeon fisheries	0	0	0	0	0	0	0	0
Total (worst case scenario)	870	44	9	8	12,000	625	70	7

[1] *h = hatchery-origin and n = natural-origin*
[2] *estimates are for all O. mykiss, which likely includes a significant portion of resident, non-anadromous rainbow trout.*

Table 7.3. Proportional natural-origin UCR steelhead mortality take limit for recreational harvest fisheries in the Wenatchee River, Methow River, and Okanogan River basin tributary areas by run size. Catch and release mortality is assumed to be 5%.

Tributary Area	Priest Rapids Dam Count	Escapement to Tributary Area	Mortality Impact	
			Proportion	Count
Wenatchee River and Columbia River above Rock Island Dam to below Rocky Reach Dam				
	<837	<599	0%	0
Tier 1	838	600	2%	12
Tier 2	2,146	1,700	4%	68
Tier 3	3,098	2,500	6%	150
Methow River and Columbia River above Wells Dam				
	<803	<499	0%	0
Tier 1	804	500	2%	10
Tier 2	2,224	1,600	4%	68
Tier 3	3,386	2500	6%	150
Okanogan Basin upstream of the Highway 97 Bridge				
	<175	<119	0%	0
Tier 1	176	120	5%	6
Tier 2	180	120	7%	8
Tier 3	795	600	10%	60